APPLICATION

FOR

UNITED STATES LETTERS PATENT

TITLE: **SEMISUBMERSIBLE OFFSHORE VESSEL**

APPLICANT: **FERNANDO C. FRIMM**
HARRIS I. KNECHT
THOMAS D. CONDON

"EXPRESS MAIL" Mailing Label Number EI 267842649 US

Date of Deposit 9/8/97

I hereby certify under 37 CFR 1.10 that this correspondence is being deposited with the United States Postal Service as **"Express Mail Post Office To Addressee"** with sufficient postage on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Alan D. Rosenthal

Alan D. Rosenthal

SEMISUMERSIBLE OFFSHORE VESSEL

Background of the Invention

Various types of vessels are commonly used for drilling wells offshore, including barges, jackups, drill ships, and semisubmersibles.

Semisubmersible vessels typically have a superstructure deck or decks supported by columns which are attached to hulls or pontoons which have adjustable ballast capability. By adjusting the ballast carried by the pontoons, the pontoons may be positioned at or near the surface of the water or in a submerged location below the surface of the water, while the superstructure deck remains above the surface of the water. While being moved to a location where the vessel is to be used, the pontoons typically are ballasted to permit them to ride at or near the surface of the water, facilitating transport of the vessel. After reaching the desired location, the ballast of the pontoons may be adjusted to cause the pontoons to become submerged below the surface of the water, providing improved stability and reduced motion of the vessel in rough, deep seas. The vessel may or may not be self-propelled.

The pontoons in turn support the superstructure deck by columns which rise vertically or substantially vertically from the ring pontoon at various locations, as well as braces which may interconnect the pontoons, the pontoons and the columns, the columns and the superstructure, and/or two or more of the columns. The purpose is to provide a strong and substantially rigid base structure to support the deck(s) of the superstructure.

The interior of both the columns and the pontoons may be subdivided by bulkheads to strengthen the structure,

2

to provide enclosed spaces for locating and storing various equipment (e.g., anchors, chains, propulsion mechanisms, etc.), and to provide a plurality of separate tanks for purposes of ballasting the vessel and storing various fluids and other materials which may be required or desired during drilling or produced by the well.

The columns typically have been placed such that the vertical centerline of the columns intersects the axial centerline of the starboard or port pontoon on which the column is located. In a ring pontoon semisubmersible vessel previously proposed, the four corner columns have been placed such that the vertical centerline of the columns intersects the axial centerline of the forward or aft pontoon as well.

Summary of the Invention

The present invention relates to improvements in ring pontoon semisubmersible vessels.

In one embodiment of the present invention, the columns are located such that the centerline of the column is displaced from the axial centerline of the forward and aft sections of the ring pontoon. A vertical partition in each column lies in the same plane as, and therefore forms an extension of, the interior side of either the forward or the aft section of the pontoon ring.

In another embodiment of the invention, the columns also are located such that the centerline of the column is displaced from the axial centerline of the starboard and port sections of the ring pontoon.

3

Brief Description of the Drawings

Figures 1, 2, and 3 are the side elevation, cross section, and plan views respectively of one embodiment of the invention.

Figures 4A, 4B, 4C, and 4D show exemplary centerline vertical cross sections of the ring pontoon in various embodiments and at various locations along the ring pontoon.

Figures 5, 6, and 7 are the side elevation, cross section, and plan views respectively of another embodiment of the invention.

Figures 8, 9, and 10 are the side elevation, cross section, and plan views respectively of yet another embodiment of the invention.

Description of the Preferred Embodiments

This invention relates to improvements to ring pontoon semisubmersible vessels.

In a ring pontoon vessel such as is shown in Figures 1, 2, and 3, the forward, aft, starboard, and port pontoons **11**, **12**, **13**, and **14**, respectively, form a ring **10**. The shape of the ring is not required to be circular, and typically is either substantially square or rectangular, although other shapes (e.g., hexagonal, octagonal, etc.) are possible. The ring **10** shown in Figure 3 may be considered to be substantially rectangular, or may be considered to be octagonal.

The vertical cross section of the ring is either substantially square or rectangular. Other cross sectional shapes (e.g., octagonal, etc.) are possible. The vertical cross-section of the starboard pontoon **13** and the port pontoon **14** is substantially rectangular, having curved edges. While the vertical cross section of the ring may be symmetrical, that is not required.

4

Moreover, the vertical cross section of the ring **10** may vary from location to location along the longitudinal axis of the ring. For example, as shown in Figure 4, the vertical cross section of the forward pontoon **11** and/or the aft pontoon **12** may be substantially different from the vertical cross section of either the starboard or port pontoons **13** and **14**. Figure 4A is representative of a centerline vertical cross section for the starboard and port pontoons **13** and **14**, and also may represent the centerline vertical cross section for the forward and aft pontoons **11** and **12**. Alternatively, either or both of the forward and aft pontoons may have a significantly different vertical cross section. Examples of alternative centerline vertical cross sections are shown in Figures 4B, 4C, and 4D, which represent a "barge bow" cross section (Figure 4B), a raised reduced cross section (Figure 4C), and a lowered reduced cross section (Figure 4D). When a reduced cross section is selected for the design of the forward and/or aft pontoon, there will be a transition region **20** at which the cross section of the forward and/or aft pontoon transitions from one cross sectional shape to another.

Typically, the centerline vertical cross sections of the starboard and port pontoons, and the centerline vertical cross sections of the forward and aft pontoons, would be the same, although this is not required. Similarly, the centerline vertical cross sections of all of the pontoons may be the same.

As shown in Figure 3, each pontoon is subdivided by at least one vertical bulkhead **31** which is parallel to the longitudinal axis of the pontoon, and may be subdivided further by one or more vertical partitions or bulkheads **32** which are transverse such axis, into various fluid tight compartments or tanks. Similarly, each column is divided by

one or more vertical partitions or bulkheads **33** and **34** into multiple compartments or tanks. These partitions or bulkheads also contribute to the structural strength and rigidity of the pontoons and the columns.

Also shown in Figure 3 are four additional tanks or compartments **40** which have been formed, one at each of the interior corners of the ring **10**. These additional tanks or compartments further reinforce and become part of the ring **10**.

As shown in Figure 3, the vessel uses at least four corner columns **61**, **62**, **63**, and **64**, which are connected to the pontoon ring **10** near the forward and aft ends of the starboard and port pontoons, respectively. Additional columns, such as columns **65** and **66**, also may be used if desired. The columns support the superstructure deck **70**, as shown in Figures 1 and 2, above the pontoon ring **10.**

Additional braces **50** may extend radially inward from the ring pontoon **10** to locations on the superstructure deck **70** located inwardly of the ring pontoon **10**, and serve to further reinforce and strengthen the vessel.

In one embodiment of the invention, each the corner columns **61**, **62**, **63**, and **64** are located at positions on the ring which permit at least one of the interior vertical bulkheads of such column to be in the same plane as either the interior or exterior surface of the pontoon. As shown in Figure 3, vertical bulkhead **33** in each of the four corner columns lies in the same plane as the interior surface **38** of the forward pontoon or interior surface **39** of the aft pontoon. This permits the vertical bulkhead **33** to be formed as an extension of the interior surface **38** of the forward pontoon or interior surface **39** of the aft pontoon.

Locating each of the four corner columns as described permits the center of each of such column to be

6

displaced horizontally from the axial centerline of the forward and aft pontoons, while taking advantage of the structural integrity which results from having a vertical surface of the pontoon be contiguous with and extend into one of the interior vertical bulkheads in the column. By displacing the center of the corner columns horizontally from the axial centerline of the forward and aft pontoons, movement of the superstructure deck due to wave motion is reduced.

In another embodiment of the invention shown in Figures 5, 6, and 7, the positions of the columns are displaced even more, such that an exterior vertical surface of the column lies in the same plane as the opposite surface of either the forward or aft pontoon. Thus, the most forward surface of the column **61** is in the same plane as the most aft vertical surface of the forward pontoon **11**, and the most aft surface of the column **62** is in the same plane as the most forward vertical surface of the aft pontoon **12**.

In the embodiment shown in Figures 5 6, and 7, braces **50** extend from each of the corner tanks or compartments **40** to the deck of the superstructure **70**.

In yet another embodiment of the invention shown in Figures 8, 9, and 10, the positions of the four corner columns have been displaced not only from the axial centerlines of the forward and aft pontoons, but also from the axial centerlines of the starboard and port pontoons. This permits even further reduction of the movement of the superstructure deck due to wave action, while retaining a very strong and rigid base structure.

What is claimed is:

7